REMARKS

Claims 72-95 are pending in the present application and at issue.

It is respectfully submitted that the present amendment presents no new issues or new matter and places this case in condition for allowance. Reconsideration of the application in view of the above amendments and the following remarks is requested.

I. The Rejection of Claims 72-90 under 35 U.S.C. 103

Claims 72-90 are rejected under 35 U.S.C. 103 as being unpatentable over Lischnig et al. (Biotechnology Letters, Vol. 15, No. 4, pp. 411-414 (1993)) or Gomes et al. (Appl. Microbiol. Biotechnol., Vol. 39, pp. 700-707 (1993)) or Alam et al. (Enzyme Microb. Technol., Vol. 16, pp. 298-302 (1994)) and Haarasilta et al. (U.S. Patent No. 5,314,692) and Hazlewood et al. (WO 93/25693). This rejection is respectfully traversed.

Lischnig et al. disclose an endo-beta-xylanase derived from *Thermomyces lanuginosa*, DSM 5026, which has a pH optimum of 6.5 and is active at pH values up to 9.0, and has a residual activity of at least about 80% after incubation at 70°C for 10 minutes at pH 6-9. Lischnig et al. also disclose that the xylanase shows sufficient thermostability for use as a bleaching aid in the pulp and paper industry.

Gomes et al. disclose a xylanase derived from a *Thermomyces lanuginosa* strain, which was deposited at Deutsche Sammlung von Mikroorganismen und Zellkulturen under the number DSM 5826. Gomes et al. further disclose that the xylanase was almost thermostable (91-92%) at pH 6.6 and 9.0 after 41 hours preincubation at 55°C and lost only 20-33% activity after 188 hours. Gomes et al. further disclose that the xylanase is extremely valuable in the bleaching of paper pulp.

However, neither Lischnig et al. nor Gomes et al. disclose animal feed compositions comprising a thermostable xylanase of Family 11, as claimed herein.

Alam et al. disclose thermostable xylanases derived from *Thermomyces lanuginosus* and *Thermoascus aurantiacus*. These xylanases are dislosed as holding a great potential for application in pulp, paper, and jute fiber processing industries. In the summary of Alam et al. (lines 3-4), it is further disclosed that *T. lanuginosus* produced cellulase-free xylanase, and *T. aurantiacus* produced only a small amount of cellulase in addition to xylanase. Alam et al. do not in any way whatsoever teach or suggest the use of the disclosed *Thermomyces* xylanases in animal feed applications. The only disclosure relating to animal feed in Alam et al. is in the introduction where Alam et al. state that in some cases, there is a synergistic effect between

xylanases (in general) and cellulase, e.g. maximum conversion of lignocellulose into liquid feedstocks and increasing the digestibility of animal feed. However, this statement clearly does not apply to the *Thermomyces* xylanases since they are either cellulase-free or have only a small amount of cellulase, and furthermore the only disclosure of utilities of the *Thermomyces* xylanases in Alam et al. is biopulping and jute fiber processing (see page 301, left hand column, last paragraph). Thus, Alam et al. do not disclose the use of *Thermomyces* xylanases in animal feed applications.

Significantly, none of the cited references teach or suggest the use of thermostable xylanases in animal feed compositions, or that there would be any advantage to using a thermostable xylanase over a thermolabile xylanase in animal feed.

Moreover, animal feeds comprising a thermostable xylanase of Family 11 according to the present invention have significantly improved feed utilization. In contrast, animal feeds comprising another xylanase (namely, a thermolabile xylanase of Family 10) did not have a significantly improved feed utilization. Applicants enclose a Declaration Under 37 C.F.R. 1.132 of Dan Robert Pettersson. Mr. Pettersson states in paragraph 6 of his Declaration that "these results are surprising and unexpected."

Furthermore, Applicants have demonstrated that the use of thermostable xylanases of Family 11 according to the present invention significantly improves feed utilization as compared to other xylanases. For example, Example 6 of the specification demonstrates that, surprisingly, a *Thermomyces lanuginosus* xylanase of the present invention has significantly improved properties in reducing wheat viscosity in vitro than a prior art xylanase (a commercially available multicomponent enzyme preparation derived from *Humicola insolens*). Figure 4 also shows a much higher efficiency of this xylanase as compared to the prior art xylanase per unit dosage with respect to viscosity reduction. Using for example 1.29 activity units per gram of wheat of each of these xylanases, the relative viscosity when using the xylanase of the invention is about 40%, whereas it is only about 75% when the prior art xylanase is used. Mr. Pettersson states in paragraph 7 of this Declaration that "these results are surprising and unexpected."

Mr. Pettersson also discusses the results of Example 8, which compares the digestibility of animal feeds comprising a thermostable xylanase of Family 11 ("A" and "B") with the digestibility of an animal feed comprising Bio-Feed Plus ("C"), a commercially-available xylanase preparation derived from *Humicola insolens*). The results show that the use of Bio-Feed Plus at a dose of 400 FXU/kg gave a % fat digestion of 72.4, whereas the animal feeds comprising a xylanase of the present invention gave a % fat digestion in the range of 72.1-74.3 even though the xylanase was

dosed at 100 or 200 FXU/kg (one quarter or one-half, respectively, of the Bio-Feed Plus). These results demonstrate that animal feeds comprising a thermostable xylanase of Family 11 have a significantly better digestibility than an animal feed comprising Bio-Feed Plus. Mr. Pettersson states in paragraph 8 of his Declaration that "these results are surprising and unexpected."

In the Advisory Action, the Office states that it is not persuaded that the results are surprising and unexpected. First, the Office states "it is not clear as to how a carbohydrase known to act on complex carbohydrates can increase % fat digestion or how the activity of the xylanase contributes towards fat digestion." This is respectfully traversed.

Without being bound to any theory, it is believed that xylanases reduce the intestinal viscosity of birds fed cereal based diets by degrading the soluble arabinoxylans. High levels of soluble non-starch polysaccharides (such as arabinoxylans) increase digesta viscosity in the intestine of chickens, which leads to a reduction in starch, protein and lipid digestion. High viscosity impairs absorption over the gut wall by reducing the diffusion properties of both nutrients and digestive enzymes. High viscosity also results in a loss of bile acids, which play an important role in fat digestion. High viscosity may also reduce feed intake by creating a sensation of satiety in the bird, which also reduces animal performance. See, e.g., Pettersson and Åman, "Enzyme supplementation of a poultry diet containing rye and wheat," Br. J. Nutr., 62: 139-149 (1989); and Annison, "Relationship between the levels of soluble nonstarch polysaccharides and the apparent metabolizable energy of wheats assayed in broiler chickens," J. Agric. Food Chem., 39: 1252-1256 (1991).

Second, the Office states that "applicants have not demonstrated as to what would have been the % fat digestion values of commercial enzyme at lower doses, it is quite possible that the enzyme concentration of 400 FXU/kg may be a saturating concentration such that increased amounts of the enzyme had no effect on the % fat digestibility." This is respectfully traversed.

As mentioned in the prior response, the same xylanase is used in Examples 6-8. The results of Example 7 (shown in Table 2) show that the xylanase performs better when dosed at 800 FXU/kg. Accordingly, 400 FXU/kg is not a saturating concentration. Furthermore, the results of Example 6 (shown in Figure 4) show that a dosage of 400 FXU/kg (corresponding to 0.4 FXU/g) is not a saturating concentration. Thus, one of ordinary skill in the art would expect that a lower lose of the commercial xylanase would have resulted in a significantly lower feed utilization at a lower dose.

For the foregoing reasons, Applicants submit that the claims overcome this rejection under 35 U.S.C. 103. Applicants respectfully request reconsideration and withdrawal of the rejection.

II. The Rejection of Claims 72-90 under the Doctrine of Obviousness-Type Double Patenting

Claims 72-90 are rejected under the doctrine of obviousness-type double patenting as being unpatentable over claims 1-17 of U.S. Patent No. 6,245,546.

Applicants will submit a terminal disclaimer upon an indication of allowable subject matter.

III. Conclusion

In view of the above, it is respectfully submitted that all claims are in condition for allowance. Early action to that end is respectfully requested. The Examiner is hereby invited to contact the undersigned by telephone if there are any questions concerning this amendment or application.

Respectfully submitted,

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